Trip Summary: International Scan on Asset Management: Australia, Canada, England, and New Zealand
April 8-April 24, 2005

Introduction

The purpose of this international scan was to investigate asset management experience, techniques and processes in the world. Lessons from this experience could be very relevant to the U.S. for better understanding how asset management applications can be used to enhance the effectiveness of decision making and infrastructure management in federal, state, and local transportation agencies. With the significant infrastructure preservation and capital replacement challenge facing the U.S. transportation system, the lessons learned from this scan could provide important indications of how those who have been working on this issue for some time have approached the problem from both an institutional and technical point of view.

Scan Context and Panel Composition

Asset management is an important concept to transportation professionals working at many levels of government and in the private sector. To reflect this range of potential application, the scan panel represented a diverse set of interests and concerns for national, state, and local-level decision making. The Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO) and the National Cooperative Highway Research Program (NCHRP) jointly sponsored this scan. In addition to FHWA officials (at the Headquarters and field levels), the panel included representatives from the departments of transportation for the states of Michigan, New Mexico, New York, and North Carolina; a representative of the American Public Works Association (APWA) and local government from the City of Portland, Oregon Office of Transportation, and a university professor representing the Transportation Research Board (TRB) Committee on Asset Management. These panel members represented a diverse set of interests and expertise in the areas of asset management, bridge and pavement management systems, transportation policy and planning, and transportation system operations.

The scan team met with the following types of representatives during its 17-day trip.

- National transportation agencies—England and New Zealand
- National rail provider---England
- Provincial or state departments of transportation---Alberta (Canada) and New South Wales, Queensland, and Victoria (Australia)
- City transportation and infrastructure officials---Brisbane (Queensland); Edmonton (Alberta); in England (representing London and some other local governments); and in New Zealand (representing urban and local communities)
- Transit provider---Brisbane (Queensland)
- Toll authorities---New South Wales and Victoria
- Public/private partnership concessionaires---New South Wales and Victoria

- Private providers of maintenance services---England
- Research organizations---England, New South Wales, and Victoria
- Professional engineering/asset management associations---Australia, England, New South Wales and New Zealand

General Observations

The scan team has identified 32 observations that are of interest to officials in the U.S. These observations are organized in five major categories---asset management's role in decision making, leadership and organizational structure, asset management technical activities, program delivery, and human resources.

Asset Management's Role in Decision Making

1. **Each site visited has made a commitment to, and allocated resources for, developing an asset management program**, although the approaches varied in scope and content. No common, integrated asset management model was found in the sites visited; the basic components of each asset management effort were the same. Importantly, asset management approaches were found in situations where maintenance outsourcing was a major part of program delivery, as well as where program delivery was done primarily with an agency's own staff.
2. In all of the sites visited, **the agencies were competing for resources across all government programs** (such as education, public safety, community services, etc.).…very few agencies had access to transportation-specific revenue sources. The agencies thus had to compete as "whole-of-government." With respect to asset management's role in such a decision-making context, there were several examples where the existence of **good data on infrastructure needs provided justification for additional funds** to be put into transportation infrastructure programs.
3. Top elected and politically appointed government transportation officials have held their positions for a long time (in U.S. terms). Once these individuals were convinced of the value of an asset management approach, their **continuity in government assured a stable environment for asset management to evolve**.
4. **Several major drivers were identified for adopting an asset management approach** Similar to the U.S., increasing numbers of trucks using the road network, aging infrastructure, and congested road networks have created pressures on infrastructure owners. This has resulted in a need to manage better an important asset base with limited resources, and providing this management responsibility with a limited number of staff (in some cases, staff cutbacks), while at the same time maintaining staff capability. Finally, linking asset management to broader community and agency goals and analyzing tradeoffs among asset categories were mentioned as important characteristics of individual asset management efforts. In several cases, asset management was adopted during hard economic times, and was thus viewed as a way of providing the most cost efficient program delivery.
5. In some cases, **national or state legislation has been an important catalyst to view asset management in a different way** (e.g., New Zealand's sustainability law and

Land Transport Act and Victoria's Road Management Act). In Australia, in particular, a recent judicial interpretation of the liability law has been an important factor for developing (Victoria) or thinking about (Queensland and New South Wales) a more systematic approach toward asset management. In England, national laws requiring the development of local transport plans and the legal mandate to maintain a community's asset base have led to better integration of asset management into local level planning and decision making. In many of the cases, changing governmental accounting rules have also motivated a closer examination of the road asset inventory and how to assign value to assets.

6. Although many factors drive political decisions for putting more funding into transportation, many of those interviewed felt that having **a good asset management program conveyed to elected officials strong stewardship of transportation assets**, and has been an important consideration in increasing funding for transportation. In other words, agencies have been able to demonstrate the need for additional support, the link between investment and system performance, and the effect on the community of investing in infrastructure (Alberta, New Zealand, and VicRoads, in particular, illustrate this).

7. **Statements of intent tie an agency's vision and key goals to levels of service or performance measures, thus providing important "vision" and "accountability" points of departure for asset management**. These performance measures, most of which do not deal with asset management, are used to assure that agency actions relate to government policies. In the case of asset management, performance measures relating to the condition, utilization and functionality of the transportation asset have been used to analyze tradeoffs across assets, monitor system performance trends and the overall effectiveness of investment programs. In England, for example, the asset management approach that is being encouraged for local governments by the national Department for Transport is based on performance indicators and targets.

   At the strategic or upper management level, only the most important information needed for establishing funding policies by agency heads or for monitoring agency progress toward policy achievement was provided (in other words, they focussed only on the most important "few"). The operating core of the agency often received and produced information on many different performance/condition measures.

8. **Asset management has been integrated into the many different corporate or agency planning and policy documents**. For example, we found asset management incorporated into strategic policy statements/agency visions, performance measures, asset-specific plans (e.g., state highway plans), tactical operations (e.g., contract specifications for maintenance outsourcing), and job descriptions. Asset management was incorporated into multiple year planning efforts, often found in 1-year, 5-year, 10-year and 25-year plans. The "total asset management approach" thus seems to support consistency in agency directions and activities.

9. Some of the more advanced examples of asset management have also begun to **integrate asset management principles and activities into a range of agency activities and products that are not specifically focussed on asset management.**

This reflects the fact that many of the agencies were facing transportation problems similar to the U.S., e.g., congestion, safety, system operations, environmental quality, etc. and that many non-major asset-based solutions (such as operations strategies) are being considered. For example, Transit New Zealand is attempting to link asset management efforts to its environmental policy and at the local level to community quality of life. In England, asset management is supposed to be incorporated into local transportation plans that focus on many different aspects of transportation system performance.

10. It was interesting to note the **blurring of what is maintenance and how it relates to asset management for investment decisions**. In some cases, periodic maintenance was portrayed as the asset management program, rather than being just one component of such a strategy. New South Wales has incorporated "capital renewal" projects (which in some cases meant total replacement of existing structures or portions of roads) into its network infrastructure program, a program that focuses on infrastructure maintenance and rehabilitation. The justification for this was that such projects are acceptable as long as road capacity is not increased. Projects that significantly increased capacity were considered as part of the formal project development process, often requiring environmental assessment studies.
11. **There seemed to be consistency and cooperation in some cases among different levels of government in their approach toward asset management.** National or state agencies were working with local governments in providing guidance and/or participating in user groups. This was especially true in Alberta, England and New Zealand, and in some cases in Australia.

Leadership and Organization

12. **Top level agency commitment (at the very highest levels) in support of asset management was apparent in every case**. Asset management was viewed by the CEO/COO of the agency as an important tool for managing the agency's portfolio and for maintaining credibility with the agency's constituencies. Part of obtaining this high level commitment was showing how asset management could produce more cost effective program results.
13. In almost all cases, **changing the organizational culture to think of asset management as a key business area** was pointed to as the key challenge. The evolution in the use of asset management was thus viewed as changing the culture of the organization.
14. **Each of the agencies had a management position or office responsible for asset management**. This focal point for asset management seemed to provide guidance to other units in the organization and acted as a filter for asset information that was directed to different decision makers in the agency. In addition, this office usually acted as a major participant in national or state efforts to enhance asset management activities more broadly.
15. One of the most important aspects of the observed asset management programs was **the "bringing together" of agency resources and capabilities for undertaking**

asset management and for creating an "asset management" culture in the organization. Thus, although many different units within an organization collected data and produced information on particular asset performance and condition, in several cases, this information was synthesized at key decision points in the agency.

Technical Approaches and Data Use in Asset Management

16. **Life cycle costing (also known as "whole-of-life" costing) has been adopted** in each site as the basic approach toward program and project costing. Importantly, data identification and collection were targeted to support this approach.

17. Although the scan team was looking for examples where trade-off analysis occurred among different asset categories or among different programs areas (such as maintenance, capital expansion, capital renewal)**, in only a few cases was any effort made to conduct such technical trade-off assessments, and these were heavily based on engineering judgement**. It was clear that all of the agencies were working toward such a capability.

18. Perhaps in some sense relating to cultural differences in planning terminology, **many of the officials talked about "optimizing" decisions or "optimization approaches**." In U.S. terms, this would mean the use of quantitative analysis techniques to produce the most economically efficient outcome. We believe the term, as used, really meant providing a balanced investment portfolio that reflected community goals and policy desires.

19. **Risk assessment was used by all of the agencies in their asset management program**. For example, the likelihood of disruption or failure of certain types of infrastructure was made a conscious part of the asset management analysis in New Zealand (subject to high levels of natural disruptions). In Edmonton, a risk or vulnerability measure has been developed and incorporated into the formal project assessment process. In New South Wales, the assessment of "risk" seemed to be a driving force in developing the network infrastructure program. In England, risk was used to help prioritize projects. Not surprisingly, the risk assessment associated with a concessionaire's participation in a public-private partnership related to those factors that affected revenue generation, while that for public services tended to be related to factors of safety, public support and customer services.

    It seemed that **the risk assessment approach was also used as a way of educating and obtaining asset management buy-in from elected officials**. The scan team's sense is that all of the sites visited have better formalized applications of risk and apply them in asset management much more than in the U.S.

20. **Government accounting procedures were not viewed in several cases as appropriate for assigning value to assets and were viewed as inappropriate as a driver for asset management decisions**. Although in most cases the accounting value is reported (because of governmental requirements), other measures are used to augment the overall asset management valuation scheme (and as was said in one case, "we use the accounting procedures, but they don't drive our investment priorities"). The greatest departure from traditional accounting procedures was found in Queensland where asset management systems are used to determine the value of the

asset, rather than simply using straight-line depreciation, which was considered to be of little or no value. England as well is adopting an asset management approach toward asset valuation.

21. The process of implementing asset management, and most importantly in piecing together the supporting databases, was described **as first defining core purposes of the agency and of the investment program, then determining the necessary technical support structure.** In this construct, several of the agencies visited viewed data itself as an asset that had to be managed and replaced when it was no longer serving its function.

22. All of the agencies visited have adopted the approach of developing **locational referencing systems for database support for asset management**. Thus, instead of creating one comprehensive database for all assets for which the agency is responsible, agencies are relying on existing databases (even when they have been developed with different formats and levels of comprehensiveness) to support their asset management program. In addition, several of the agencies adopted quality control procedures to make sure that the data collected for these databases was of high quality. In one example, 30 percent of the lane kilometers were re-sampled every year to check the consistency, accuracy and uniformity of the original data collection. It should be noted that in some cases agencies are beginning to question the range of data collected and to assess the data's usefulness in supporting the decision-making process. The availability of cost data to support life cost analysis was also impressive.

23. One of the impressive aspects of the database systems was the **wide extent to which the data was available within an agency**…many said that if you have a computer on your desk, you can access the asset management database.

24. **Data collection approaches and technologies are not that different from those used in the U.S.** We saw on national networks pavement condition measuring vehicles (SCRIM and RoadCrack), falling weight deflectometers, ITS collection of traffic data, use of GIS and GPS, use of the International Roughness Index (IRI), etc. Somewhat different from the U.S., a lot more data is typically collected on a range of characteristics (e.g., skid resistance data using the SCRIM). VicRoads is exploring the use of on-ground sensors, early warning systems, and non destructive testing technologies as part of its data collection efforts. At the other end of the technology spectrum, in London, annual visual inspections are conducted of asset condition using clipboards recognizing the environment and type of data needed.

25. **The experience with deterioration modelling is not uniform** across the agencies visited, and in many cases, was quite limited. For example, there is no common definition of "remaining service life" for different assets, and in some cases, there was a basic questioning of what this concept really meant. The experience with deterioration modelling ranges from commonly used software programs to reliance on experience and expertise in determining the most critical investments for preserving or enhancing future system performance.

Program Delivery

26. One of the most interesting observations from this scan is the **importance of incorporating strong asset management principles in public/private partnership (P3) agreements when such projects are considered.** This was especially true in Victoria and New South Wales where agency officials described the learning process they went through in subsequent P3 projects to have a better asset management provision incorporated into the concessionaire's agreement or deed. The model that seems to have been adopted in the sites visited was the use of input/output performance criteria as part of the concessionaire's deed that, in essence, guided the asset management strategy for the project. The contracts in some cases were quite long (39 years) to reflect the time it took for the concessionaire to earn what he thought was a reasonable return on investment. In addition, tolls were set in order to generate enough funds to maintain the facility at a high level of service. The response from the concessionaires was to provide adequate funding in their business model to provide the desired asset management program. This institutional learning process is an important experience for U.S. asset owners who are considering entering into such arrangements.

27. **Private contracts for delivering maintenance and minor capital construction programs were used at varying levels of application**. Privatization of maintenance and minor capital construction was never mentioned as a prerequisite for asset management. The outsourcing of this function differed by jurisdiction, ranging from all maintenance being outsourced in New Zealand to much smaller levels in New South Wales and Brisbane, where political pressure to keep a public labor force was a strong limitation to outsourcing. Preventive and renewal maintenance are important parts of a comprehensive asset management program, and thus the relationship between how and when assets are maintained and the program responsibilities of the contractors becomes an important consideration in determining the overall effectiveness of asset management efforts. The key approach was to **encourage contractor "ownership" of asset management in the delivered program**. For example, in a performance-based contracting regime, how does an agency make sure that the structural integrity of pavements is maintained or addressed when contractors are making maintenance investment decisions? In some cases, where contracts were let before a system of performance management was in place, questions of service quality, asset condition, and price occurred.

    It was also of interest that England, which has had many years of experience with maintenance outsourcing, seems to be evolving back to a hybrid strategy of service provision by including owner agencies in service provision partnerships, and in some cases, again providing services themselves.

28. Efforts have been made in each case to **reach out to public officials and, in some cases, to the general public, in conveying the importance of an asset management policy.** In Edmonton and New Zealand, for example, such outreach has been considered successful in developing support for agency funding. In all cases, the state ministers of transportation have "bought into" asset management as an important policy focus. Interestingly, in at least two cases (New Zealand and Victoria), focus groups were used to affirm the importance that had been assigned to maintenance and

capital renewal program investment. In other cases, focus groups were commonly used to determine the attitudes and reactions of the general public toward the agency's priorities and resource allocation. In Edmonton, an infrastructure advisory committee consisting of important business and community leaders has been established.

29. New Zealand and England, in particular, have **very active asset management professional associations and user groups, spearheaded by local officials, that have developed materials** aimed at both public officials and practicing transportation professionals. The scanning team found very impressive asset management outreach material in England and New Zealand. In both cases, the initiatives were spearheaded by local government associations or national working groups (or alliances as they were called). Austroads, Australia's equivalent to AASHTO, is in the process of putting together asset management material, much of which is found in separate reports.

Human Resources

30. An effective asset management program has a **strong human resource element**. In some cases, an asset management program (and usually private outsourcing of maintenance) was implemented at the same time as staff cutbacks occurred. Every agency visited, however, noted that a good asset management program requires knowledgeable staff with the capabilities in understanding data, the data collection process, and what the data mean. With respect to private concessions for data collection and maintenance efforts, the owner agencies had to have capable staff to manage the contracts. In almost every case, the agencies have added staff since their low points in the 1980s and 90s to manage, oversee, and audit the contractors. Training (see below) thus also becomes an important human resource support activity.
31. Several agency personnel systems have **created job positions with asset management in the job responsibilities**. As was noted in England and New Zealand, positions for asset management professionals, and civil engineers in general, are being advertised for local governments with only limited success in attracting qualified applicants.
32. **Asset management training** has been an important aspect of an agency's own asset management strategy in many of the agencies visited, not only for their own staff, but also for other jurisdictions that are using asset management approaches. In Alberta, England, New Zealand and Queensland, in particular, manuals and best practice procedures have been developed to promote consistency in asset management applications.

Lessons for the U.S.

A large number of "lessons learned" have resulted from this scan.

1. Asset management was adopted in all of the countries visited as a major policy direction for national, state and in some cases local transportation programs. Although not all of the tools for conducting strategic asset management were found (e.g., approaches for conducting trade-off analysis among asset categories), **it is clear that asset management as an organizational culture and as a policy direction is a critical foundation for transportation programs that are facing significant capital renewal and preservation needs**. The U.S. is clearly facing such a challenge.
2. Given the importance of asset management in changing an organization's culture, it is important to **think carefully about what role asset management will play** in the agency's program delivery effort. In addition, the eventual acceptance of asset management within an organization's culture will occur when the benefits of such an approach are evident.
3. **Adopting an asset management approach in an organization does not mean that everything has to change**. In the cases examined, agencies had clearly adapted their asset management efforts to the organizational context. One of the consequences of this is that incorporating an asset management culture into an organization requires a long-term commitment on the part of top management.
4. **The principles and benefits of asset management were not linked to agency downsizing or to the outsourcing of agency services**. This is a common misperception associated with asset management efforts.
5. **Creating asset manager positions or at least assigning responsibilities for the asset management function** are important foundations for an effective management program. Such a position or agency unit should report to the top management in an organization. This not only provides a focal point for asset management activities, but also can foster a champion for asset management who could act as a catalyst within the organization.
6. All of the asset management programs visited used **the concept of risk for establishing investment priorities**. Most U.S. asset management experience does not have the same level of application. Risk concepts need to be incorporated more systematically into U.S. asset management efforts.
7. Many questions were raised during the scan about how asset value is defined and assigned. Condition and remaining asset value are important indicators of the degree of need and level of service that are associated with different asset types. Based on

experience in Queensland and England, **asset management systems are much more appropriate to use for asset valuation than straight-line depreciation accounting rules**. This is especially true for pavement management systems given the long-term and multiple measures of trends in pavement condition.

8. **Asset management efforts are best achieved when they are linked to strategic goals and desired outcomes**. Asset management strategies can then be defined and measured against the use of that asset, referred to as "fit for purpose" by several of those interviewed. Stakeholder involvement in the asset management program and the audits or evaluations that are made of related efforts helps ensure "value for money" and the appropriate identification of condition standards.
9. **The most common performance measures used in the asset management scan examples related to condition, function, and capacity of the assets.** In some cases, these categories of performance characteristics can provide the basis for cross asset evaluation and investment prioritization. Engaging stakeholders in setting performance targets calibrates fact-based asset needs assessment with public desires most effectively. Stakeholder buy-in to the asset approach and performance measures lends credibility to the effort.
10. **Asset management should be strongly linked to planning and system operations.** It was apparent in several cases that efforts had been made to institutionalize asset management concepts into state/local planning efforts, and in looking at system operations strategies as being complementary to asset-based improvements.
11. Perhaps one of the most important lessons for the U.S. was found in the **integration of asset management concepts into public/private partnership agreements**. Several of the agencies that have entered into such agreements for toll roads have learned from earlier experiences that a comprehensive asset management effort needs to be part of any agreement in order to ensure the asset is returned to the owner in good condition, but also to deliver good service to users during the contract..
12. Asset management efforts are data-driven. However, **developing an asset management culture in an organization does not have to wait the many years it would take to develop database information systems.** One can start with modest efforts and evolve over time into a more comprehensive perspective.
13. **Data collected should have a clear purpose and be directly related to asset management decision making**. Data collection costs should be tracked and data itself treated as an asset, with the same design, build, operate, maintain and life cycle cost analysis as is used for other assets.
14. **Trade-off analysis techniques are more complex than simply assessing priorities within one asset category.** The scan team did not find any case where technical tools were used to assess trade-offs across assets or across asset activities. This is an important area for further development in the U.S.
15. **Cross-functional teams, consisting of engineers, finance analysts, operations staff, and communications experts,** can serve as the best means of understanding the many different aspects of asset management, such as data collection, developing strategies, and quality assurance.

16. The **use of focus groups** to establish and/or validate resource apportionments for different asset categories is a useful tool in asset management programs.
17. Prior to contracting out core services, **performance-based management systems should be in place** that allows the infrastructure owner to know what levels of service are required. This was described in the scan as being a "knowledgeable owner."
18. Although initial cost savings may be realized with contracting out of maintenance services, **such program delivery is kept most efficient when there is some ability to competitively provide service** with both public and private providers. In addition, it was apparent in most of the sites visited that although the number of maintenance personnel in agencies declined following outsourcing, the contract supervision and finance staffs have either stayed at the same levels or increased.
19. **Asset management training for all levels of transportation officials** is an important initiative for changing the culture of an organization and of establishing asset management expectations among key stakeholders.
20. For those agencies with asset management programs, an analysis of program practice, called **a gap analysis,** is recommended. Where this is done, criteria are used to measure current practice in the areas of policy, linked decision making from strategic goals to operational outcomes, data adequacy and technical tools that provide information. This analysis is now used in more mature efforts to ensure continuous process improvement in asset management efforts (Opus International, Transfund, NAMS).

Implementation Strategies, Dissemination and Recommendations

The scan team has developed the following preliminary recommendations relating to further activities that should follow from the scan. They are organized in four major categories: marketing and dissemination, policy, outreach, and research/data.

Marketing

1. The timing of this scan is most conducive to disseminating results at upcoming meetings. For example, the scan results will be reported to several AASHTO committees during 2005, some meeting very shortly after the scan team returns to the U.S. These include: the Standing Committee on Highways (May), the Standing Committee on Planning (June) the Asset Management Subcommittee (July), the AASHTO regional meetings, and the annual AASHTO meeting in September. The Transportation Research Board will be hosting the Asset Management Committee meeting (June) and the 6th national conference on asset management in November, and the American Public Works Association (APWA) will have its national meeting in September, both of which provide a great opportunity to disseminate the results of the scan. Members of the scan team are already on the conference programs.

2. In addition to the meetings above where, in many cases, scan team members are already on the agenda, the scan team will be identifying other organizations that will be contacted to determine the feasibility of providing opportunities for disseminating the results of the scan and fostering asset management principles. A preliminary list of organizations includes: the American Council of Engineering Companies (ACEC), the American Society of Civil Engineers (ASCE) Infrastructure Management Committee, the National Governors Association (NGA), Council of Mayors (COM), National League of Cities (NLC), the Association of Metropolitan Planning Organizations (AMPO), the National Association of Regional Councils (NARC), the National Association of County Engineers (NACE), the joint AASHTO/AGC/ARTBA committee, and the FHWA T^2 centers. Special efforts should be made to contact the Government Finance Officers Association to see if there are opportunities to present scan findings and perhaps engage in discussions on how asset management systems are a better way of assigning a value to infrastructure.
3. Similar in concept to the AASHTO national competition in environmental stewardship, the scan team strongly recommends that AASHTO, perhaps in conjunction with FWHA, establish a similar national competition in infrastructure stewardship and/or asset management.
4. Develop materials for and hold a summit on asset management aimed at senior DOT management.
5. Review the international material that already exists in describing asset management and its relevance to U.S. experience. Use this material in the summit and in other marketing activities.
6. Develop a toolbox for asset management that is easily understood and applied at different levels of government. To some extent, this would be based on the existing AASHTO self-assessment process and provide more information on tools, data issues and organizational strategies.
7. Examine other training that occurs in asset management, not necessarily in transportation, to determine best practices that might be transferred to the transportation sector. For example, the EPA holds an asset management training course for water infrastructure that might be very relevant to the asset management challenge in the transportation sector.
8. Prepare materials from the scan, and perhaps repackage existing materials, for the Transportation/Asset Management community practice website.

Policy

9. The AASHTO Subcommittee on Asset Management should prepare a resolution that establishes asset management as an important national and state policy. This resolution might also include guidelines for the development of an asset management policy.
10. A formal agreement among Austroads, AASHTO, and the Transportation Association of Canada (TAC) should be developed to encourage stronger collaboration in many

areas, but in particular, in asset management. Develop a strategy for encouraging attendance at each other's meetings and conferences.

11. Identify how asset management can help support the achievement of a vision for the National Highway System.
12. The FHWA Office of Planning should review the TIP/STIP requirements and certification guidelines to promote links between asset management and planning. FHWA planners should review state DOT and MPO long range transportation plans and programs for asset management principles.
13. Review legislative directives on asset management, and develop model state legislation that would promote an asset management approach toward program delivery.
14. Encourage FHWA division offices and state DOTs to consider an asset management position or assigning similar duties to existing staff.
15. Have dialogues with other federal agencies (such as the Federal Transit Administration and EPA) to define commonalities in asset management approaches that could be reflected in policy initiatives.
16. Define and review the application of asset management requirements in public/private partnership agreements in the U.S. Determine what type of information is needed and share the results of the scan with relevant groups, such as the AASHTO/ARTBA/AGC joint committee.

Outreach

17. Develop videos on asset management for three major target audiences: state DOTs, metropolitan planning organizations, and local officials.
18. Incorporate materials from the scan and links to other websites identified during the scan into the AASHTO/FHWA asset management community website. Specifically share examples on this website of documents highlighted during the scan, e.g., the Land Transport NZ *Guidelines for Maintenance of Local Roads* and the *Code of Maintenance for Roads and Bridges* in England. In addition, material from PIARC on asset management should be reviewed for appropriateness in linking to the U.S. asset management website.
19. Conduct case studies of successful elements of asset management in the U.S. and disseminate these results. These case studies would be considered best practices. One of these case studies should be focused on effective communications strategies.
20. Develop materials for the International Conference on Managing Pavement Assets that will be held in Calgary in 2007.

Research and Data

21. Propose research or synthesis projects for NCHRP on the following topics:

--Synthesis on the cost of different types of data collection as it relates to asset management decision making (possibly NCHRP 8-36b)

--Repeatability and usefulness of inspection data for urban and rural highway networks

--Before and after studies on the effectiveness of asset management efforts

--Quantify different risk categories for an asset management program

--Development of tradeoff and optimization techniques for asset management

--Linkage of 3D or design files to a geographic information system (GIS) framework

--Examine world experience with high speed deflectograph technology

22. Continue the development of Asset Manager NT and PT, and develop an implementation strategy for widespread dissemination. The scan team believes that this software program is going to be more advanced than anything found during the scan.
23. Continue the peer exchanges among states and local governments on best practices in asset management.